

PCT

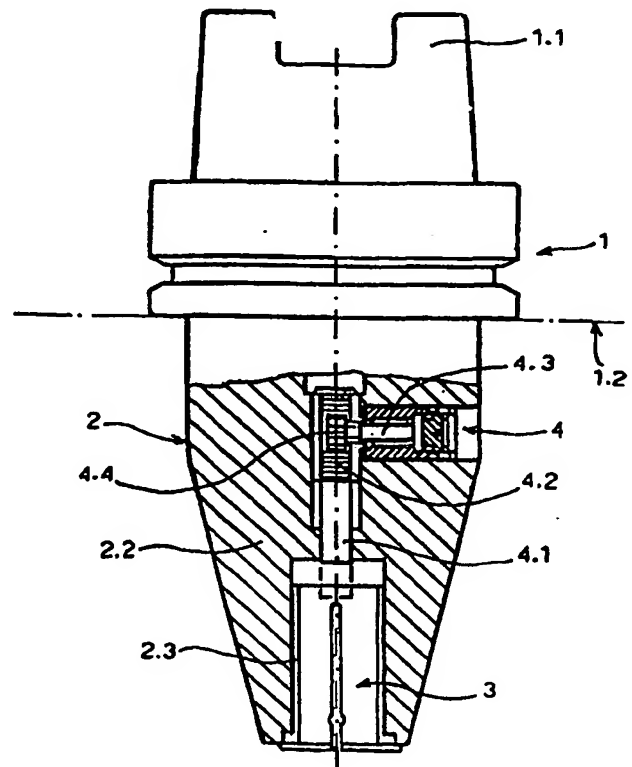
WORLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup>:</b> <b>B23B 31/26, 31/30</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 99/07505</b> <b>(43) International Publication Date:</b> 18 February 1999 (18.02.99)
<b>(21) International Application Number:</b> PCT/SE98/01439 <b>(22) International Filing Date:</b> 6 August 1998 (06.08.98) <b>(30) Priority Data:</b> 9702897-1      8 August 1997 (08.08.97)      SE <b>(71) Applicant (for all designated States except US):</b> AB SVENSKA PRECISIONSVERKTYG [SE/SE]; Fabriksgatan 6, S-631 06 Eskilstuna (SE). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> SVENSSON, Gustav [SE/SE]; N. Bergsgatan 1, S-341 34 Ljungby (SE). <b>(74) Agent:</b> WÄRULF, Olov; Oxelösunds Patentbyrå HB, Sköldvägen 36, S-613 37 Oxelösund (SE).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>In English translation (filed in Swedish).</i>

**(54) Title:** COLLET FOR A CHUCK WITH AN AXIAL POSITIONING DEVICE**(57) Abstract**

Collet for a chuck (1) with axial tool positioning in which an axial distance between the tip of a tool and a reference surface (1.2) in the chuck (1) is set by means of an axial positioning device (4) that comprises an axially moveable rod (4.1). The collet (3) comprises a collet body (3.1) that shows collet jaws (3.8) and has an external diameter adjusted to the chuck (1) and a cylinder-shaped tool opening (3.2) adjusted to the tool to be attached in the chuck (1) and that is part of a through opening. A distance piece (5) is arranged at the inner end of the collet (3) and intended to transmit an axial positioning motion between the rod (4.1) and the inner end of the tool in tool positioning.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakhstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

## COLLET FOR A CHUCK WITH AN AXIAL POSITIONING DEVICE

## TECHNICAL FIELD

The present invention relates to a collet for a  
5 chuck intended for or provided with an axial positioning  
device like a hydraulic chuck comprising an axially  
moveable rod for the tool positioning.

## BACKGROUND TECHNIQUES

In chucks with an axial tool positioning a  
10 desired axial distance is adjusted between the tip of the  
tool and a reference surface on the chuck in a pre-  
setting fixture showing a corresponding reference surface  
intended to interact with the reference surface on the  
chuck and generally connected to a projector, provided  
15 with a source of light, showing the tip of the tool and  
provided with a measuring scale that indicates the  
desired distance from the reference surface. Hydraulic  
chucks show at their fore end generally an elastic  
cylinder-shaped clamping sleeve, intended to clamp the  
20 tool inserted into the sleeve by the effect of a  
hydraulic pressure.

A known hydraulic chuck provided with a  
hydraulic clamping member for the clamping of tools and  
with a built-in axial tool positioning device comprises  
25 an axially moveable rod provided with a rack section that  
is connected with an adjusting axle provided with  
corresponding teeth and that when turning imparts an  
axial movement to the toothed rod. In normal use of such  
a chuck provided with a membrane-shaped, elastic clamping  
30 sleeve the tool gets such an insertion depth in the tool  
opening that the entire jacket surface of the clamping  
sleeve is in contact with the shank of the tool within  
the axial positioning zone of the chuck, i.e. even when  
the moveable rod in the chuck is in its outermost  
35 position, in order to not damaging the clamping sleeve by  
the increased pressure that is achieved in clamping the  
tool. If the membrane of the clamping sleeve not would

get support from the shank of the tool it could be pressed out freely and get deformed and even could break.

Up to now it has not been possible to use known collets in known adjustable hydraulic chucks. The primary cause is that tools with little diameter of shank occurring in the market also show such little insertion length that the moveable rod in the chuck not can be brought in contact with the inner end of the tool. It could actually be possible to solve this problem either by creating a tool with larger insertion length than normally which would mean increased costs for the keeping of tools at the user's or to create chucks provided with moveable rods with greater axial motion which would raise the price of those chucks. These solutions are therefore not practicable.

#### DESCRIPTION OF THE INVENTION

The object of the present invention has been achieved in a new collet intended for a chuck for axial tool positioning by means of an axial positioning device, the axial positioning device comprising an axially moveable rod that effects the inner end of the tool inserted into the chuck. The axial positioning device may be separate and be part of a separate fixture or positioning device or be built-in into the chuck.

The collet according to the invention comprises a collet body showing clamping members and has an external diameter adjusted to the chuck, and a cylinder-shaped tool opening with an inner diameter adjusted to the tool to be clamped in the chuck. The tool opening is part of a through opening in the collet whereby the moveable rod in the axial positioning device via a distance piece, for instance a separate piston, is brought in contact with the tools inner end inside the collet at an axial tool positioning.

When using a collet according to the invention this is arranged with such an insertion depth that the entire jacket surface of the clamping sleeve is in

contact with the jacket surface of the collet whereas the tool with its minor diameter of shank shows a shorter insertion length and extends a bit into the collet. By that the moveable rod in its farthest position is allowed  
5 to insert a bit into the collet in contact with the distance piece without any risk of damaging the membrane of the clamping sleeve as the collet supports the whole of the membrane in the clamping sleeve. However, nothing hinders that the distance piece protrudes a bit at the  
10 inner end of the collet.

Further features and characteristics concerning the present invention are evident from the description to the drawings subsequently and from the claims.

#### DESCRIPTION TO THE DRAWINGS

15 The invention is described subsequently as an example of an embodiment in connection with the enclosed drawings.

Figure 1 shows a hydraulic chuck seen in a sectional view provided with a collet according to the  
20 invention.

Figure 2 shows the collet according to figure 1 partly seen in a longitudinal section.

Figure 3 shows the collet according to figure 1 seen in a longitudinal section and showing a distance  
25 piece in the form of an axially moveable piston.

Figure 4 shows the collet according to figures 2 and 3 seen in a view towards its free end.

Figure 5 shows the piston of the collet seen separately.

30 Figure 6 shows a collet in an alternative embodiment.

The hydraulic chuck 1 as shown in the figures comprises an attachment 1.1 on a casing 2 intended to be connected to a machine tool. The casing 2 shows a cone-  
35 shaped section 2.2 in which a cylinder-shaped clamping sleeve 2.3 is mounted provided with an elastic membrane and intended to clamp a tool or a collet provided with a

tool inserted into the clamping sleeve 2.3 by means of hydraulic pressure. Increase or decrease of the hydraulic pressure is done by means of a hydraulic adjusting device, not shown in the figures, comprising a piston  
5 arranged on a threaded hydraulic journal provided with a notch for instance for a hexagon spanner. The tool or the collet 3 that is placed in the clamping sleeve 2.3 is clamped by screwing of the hydraulic journal into corresponding threaded holes.

10 As shown in figure 1 the casing 2 is provided with an axial positioning device 4 comprising a rod 4.1 that shows a rack section 4.2 being connected to a pinion 4.4 that is arranged on a adjusting axle 4.3. The positioning axle 4.3 shows at its outer end a notch for  
15 instance for a second hexagon spanner by means of which the positioning axle 4.3 and by that the pinion 4.4 may be turned and by that move the rod 4.1.

The collet 3, shown in figure 1 inserted into the former section 2 of the chuck 1 and shown in detail  
20 in figs. 2 and 3, comprises a collet body 3.1 with an external diameter adjusted to the chuck 1 and a cylindrical tool opening 3.2 with an internal diameter adjusted to the tool to be clamped in the chuck 1. The collet body 3.1 shows at its end in the chuck a cylinder-  
25 shaped tube 3.3 for a piston 5 that in its turn shows partly a piston section 5.1 running in the tube 3.3, partly a from this piston section protruding journal 5.2 with a diameter less than the piston section 5.1 that extends into the tool opening 3.2. The piston 5 is kept  
30 motion limited in the tube 3.3 by means of an in a slot arranged outer stopping ring 3.5 and an in the tube 3.3 arranged internal seat 3.6.

The collet body 3.1 is also provided with four longitudinal slots 3.7 and shows by that four collet jaws  
35 3.8 that, when the collet 3 is put under pressure from the clamping sleeve 2.3, springs towards and clamps the tool concerned. A flange 3.9 partitioned by the slots 3.7

is arranged at the outer, free end of the collet 3 as a stop member for the insertion of the collet into the chuck 1.

In adjustment of a desired distance between the  
5 tip of a tool and a reference surface 1.2 on the chuck 1 extending in a level perpendicular to the longitudinal direction of the chuck 1 the chuck 1 is placed in a measuring fixture connected with a measuring device that measures the distance from a corresponding reference  
10 surface of the fixture. The hydraulic pressure in the chuck 1 then is zero since the piston of the hydraulic positioning device has been unscrewed by means of the first hexagon spanner. The rod 4.1 is inserted in its inner position since the second hexagon spanner has been  
15 turned into this position. The tool, that may consist of for instance an end-cutter, is placed in the clamping sleeve 2.3 and adjusted into the desired axial position by turning of the adjusting axle 4.3 by means of the second hexagon spanner. When the desired position is  
20 reached, the first hexagon spanner is turned so that the hydraulic pressure increases and clamps the collet 3 with the tool in the desired position in the clamping sleeve 2.3.

The collet 3, shown in figure 6, shows a tool  
25 opening 3.2 that extends with the same diameter all the way through the collet 3 excepted a notch in its jacket surface for a stopping ring 3.5. A piston 5 with some minor diameter than the diameter of the tool opening 3.2 is arranged therein and provided with two friction  
30 decreasing O-rings 5.3 that lie close to the jacket surface of the tool opening 3.2. In that way the piston 5 may get inserted manually by means of the tool when inserted and pushed out with the moveable rod 4.1 when positioning the tool. It is actually not necessary to  
35 arrange a stopping ring 3.5 in the tool opening 3.2 but it is a practical measure to prevent the piston 5 to be pushed out from the collet 3 by mistake when inserting

the tool. The stopping ring 3.5 may alternately be replaced by an inserting collar or a fixed washer at the end of the collet 3.

- 5 It lies within the scope of the invention to also use the collet according to the invention in a sleeve chuck provided with an axial positioning device, not shown in the figures. In such a chuck the tool is clamped with collet jaws actuated by a surrounding, axially moveable sleeve.



## CLAIMS

1. Collet for a chuck (1) with axial tool positioning in which an axial distance between the tip of a tool and a reference surface (1.2) in the chuck (1) is set by means of an axial positioning device (4) that comprises an axially moveable rod (4.1), the collet (3) comprising a collet body (3.1) that shows collet jaws (3.8) and has an external diameter adjusted to the chuck (1) and a cylinder-shaped tool opening (3.2) adjusted to the tool to be attached in the chuck (1) and that is part of a through opening, characterized in that at least one distance piece (5) is arranged freely axially sliding at the inner end of the collet (3) and intended to be connected with the moveable rod (4.1) in the axial positioning device (4) and to transmit an axial positioning motion between the rod (4.1) and the inner end of the tool in tool positioning.

2. Sleeve according to claim 1, characterized in that the distance piece (5) is moveable between two stop positions (3.5, 3.6).

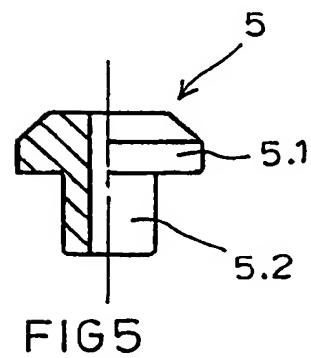
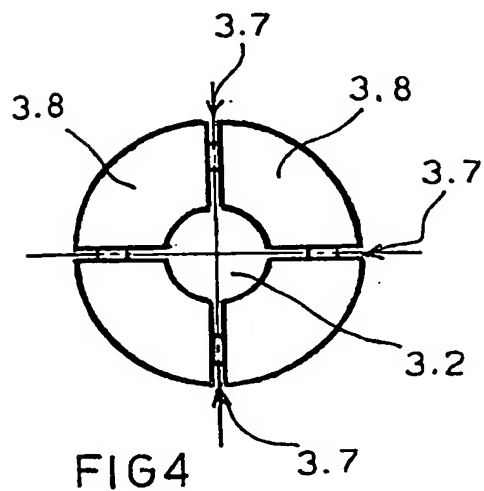
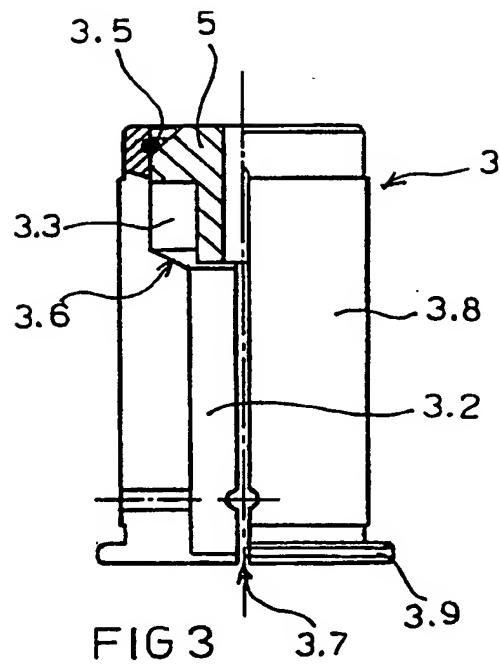
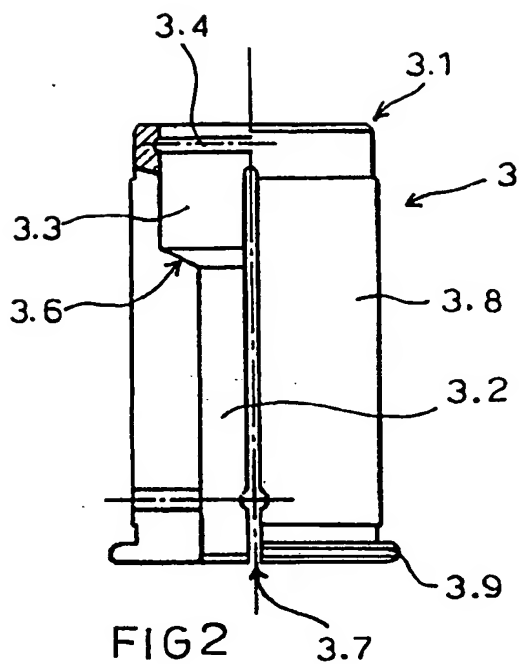
3. Sleeve according to claim 1 or 2, characterized in that the piston (5) shows a piston section (5.1) and protruding from this a journal (5.2) and that the piston section (5.1) is moveable within a tube (3.3) with a larger diameter than the diameter of the tool opening (3.2).

4. Sleeve according to claim 1, characterized in that the distance piece (5) shows friction decreasing members (5.3) that are connected with the jacket surface of the tool opening (3.2) at its extension at the inner end of the collet (3).

5. Sleeve according to claim 4, characterized in that the friction decreasing members (5.3) are one or more O-rings.

6. Sleeve according to claim 4 or 5, characterized in that a stop position (3.5) is arranged at the inner end of the tool opening (3.2).

7. Chuck according to one of the claims 1-6,  
c h a r a c t e r i z e d in that the collet (3) is  
clamped hydraulically in the chuck (1) by means of a  
clamping sleeve (2.3) provided with an elastic membrane  
s that is actuated by a hydraulic fluid.



3/3

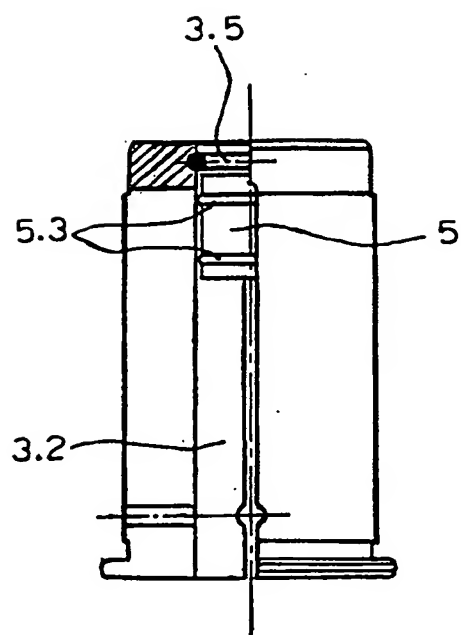


FIG 6

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/01439

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
IPC6: B23B 31/26, B23B 31/30 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols)		
IPC6: B23D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
SE,DK,FI,NO classes as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
EDOC		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5137289 A (BÜTIKOFER), 11 August 1992 (11.08.92), figure 2, abstract --	1-7
A	SE 460264 B (SPIREX TOOLS AB), 25 Sept 1989 (25.09.89), figure 2 --	1-7
A	US 4552370 A (BAUMGARTNER), 12 November 1985 (12.11.85), figures 1-6, abstract --	1-7
A	US 3718339 A (DUNHAM ET AL), 27 February 1973 (27.02.73), figure 1 --	1-7
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
13 October 1998		05 -11- 1998
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86		Authorized officer  Tycho Beckman Telephone No. +46 8 782 25 00

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/01439

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3540748 A (BUCK TOOL COMPANY), 17 November 1970 (17.11.70)  -- -----	1-7

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

27/07/98

International application No.

PCT/SE 98/01439

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
US	5137289	A	11/08/92	CH	679463 A	28/02/92
				WO	9010517 A	20/09/90
-----						
SE	460264	B	25/09/89	DE	68910146 D,T	17/02/94
				DK	105390 A	27/04/90
				DK	169229 B	12/09/94
				EP	0329633 A,B	23/08/89
				FI	92008 B,C	31/05/94
				FI	902154 D	00/00/00
				SE	8460264 B	25/09/89
				SE	8800572 D	00/00/00
				US	5067861 A	26/11/91
-----						
US	4552370	A	12/11/85	NONE		
-----						
US	3718339	A	27/02/73	NONE		
-----						
US	3540748	A	17/11/70	NONE		
-----						

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**